

Remarks

Claims 1 to 24 are pending. Claims 4 - 6 are cancelled. Claims 25 to 69 are subject to restriction and have been withdrawn from consideration. Claims 1, 7-10, 12, 13, and 15 are amended.

Support for the amendment to claims 1, and 15 may be found, for example, in the specification on page 19, Table 1, Examples 4 - 11.

Claims 7-10, 12, and 13 have been amended for clarity. Support for the amendments may be found, for example, in Claims 7-10, 12, and 13 as originally filed.

Interview Summary / Restriction Requirement

Applicants' representative, Bradford B. Wright, acknowledges a telephone interview with Examiner S. Bros on August 11, 2003 in which a restriction requirement was made between Groups I, II, and III as set forth in the current office action. In the interview, Applicants provisionally elected the claims of Group I with traverse.

Applicants hereby confirm the election of the claims of Group I, without traverse.

§ 112 Rejections

Claims 7-10, 12 and 13 stand rejected under 35 USC § 112, second paragraph, as being indefinite with respect to the usage of the phrases "at least about" and "less than about".

It is submitted that the amendments to Claims 7-10, 12 and 13 overcomes the rejection. Reconsideration and withdrawal of the rejection is requested.

Claims 1-14 stand rejected under 35 USC § 112, second paragraph, as being indefinite in that the phrase "rutile like" is indefinite as to scope. In particular, the Patent Office asserts that it is unclear how much rutile crystalline phase is present if any.

It is submitted that the phrase "rutile-like" has a definite meaning as defined on page 3, lines 16-17 of the present application, wherein it states that "rutile-like" means having a tetragonal crystal structure and a space group of $P4_2/mnm$ (#136).

Thus, if a Ti/Sb mixed oxide nanoparticle has a crystalline phase with a tetragonal crystal structure and a space group of $P4_2/mnm$ (#136), then the Ti/Sb mixed oxide nanoparticle comprises a "rutile-like crystalline phase". Alternatively, if a Ti/Sb mixed oxide

nanoparticle does not have a crystalline phase with a tetragonal crystal structure and a space group of $P4_2/mnm$ (#136), then it therefore does not comprise a "rutile-like crystalline phase". It is submitted that this provides a clear and unambiguous definition of the term "rutile-like crystalline phase".

In view of this clarification, reconsideration and withdrawal of the rejection of Claims 1-24 under 35 USC § 112, second paragraph, as being indefinite as to the phrase "rutile-like" is requested.

§ 103 Rejections

Claims 1-13, 15 and 20-24 stand rejected under 35 USC § 103(a) as being unpatentable over Bruno, US 5,776,239. The Patent Office asserts that Bruno (column 2, lines 27-33, and column 4, lines 54 et seq) discloses ultrafine hydrothermally treated powders having an average crystallite size of about 1-100 nm, preferably about 4-60 nm, with agglomerates from their primary crystalline size up to about 300 nm and having 95 to 100 percent rutile crystals. The Patent Office further asserts that Bruno differs from the claims in an exemplified composition of antimony doped titanium oxide dispersion. The Patent Office further asserts that Bruno teaches the metal oxides (titanium oxide) may be doped with 0 to at least 20 weight percent of dopant metals including antimony and said dopant metals are added to the hydrolysable titanium compound (i.e., aqueous titanium oxalate). The Patent Office still further asserts Bruno teaches the use of an autoclave, shaker tube or other pressure vessels and recovering the slurry product.

Without agreeing to the Patent Office's characterization of Bruno '239, nor that the rejection is even proper, Applicants agree that no actual examples of antimony-doped titanium oxide were actually prepared in Bruno. Although Bruno may recite antimony from among a long list of possible dopants (i.e., more than 20 dopants) for titanium dioxide ultrafine particles, it is unclear how the invention of currently amended independent claims 1 and 15 could be at once envisaged from such disclosure. It is submitted that Bruno neither properly teaches nor suggests the specific combination of antimony oxide to titanium dioxide necessary to achieve a rutile-like phase with no anatase or Sb_2O_5 phase observed by powder X-ray diffraction $\cdot 4H_2O$ (see the specification on page 18, Table 1, Examples 4-11) of currently amended Claims 1 and 15.

Although it is unclear from the discussion in Bruno, which particular antimony oxide (Sb_2O_5 , Sb_2O_4 , or Sb_2O_3) may be used as a dopant, it is submitted that regardless of the type chosen, Bruno does not explicitly teach a weight ratio of Sb/Ti in a range of from 0.42 to 2.93 as in currently amended claims 1 and 15. For example, a mixture of 20 parts Sb_2O_5 and 80 parts TiO_2 has a Sb/Ti weight ratio of 0.31, while a mixture of 20 parts Sb_2O_4 and 80 parts TiO_2 has a Sb/Ti weight ratio of 0.33, and a mixture of 20 parts Sb_2O_3 and 80 parts TiO_2 has a Sb/Ti weight ratio of 0.35, each of which is less than the lower limit of 0.42 in currently amended claims 1 and 15.

Regarding the inclusion of greater than 20 percent by weight of antimony oxide content in the compositions of Bruno, it is submitted that absent applicants' own disclosure there is no proper motivation to use such higher amounts of antimony oxide in combination with titanium oxide to achieve Ti/Sb nanoparticles comprising a rutile-like crystalline phase, especially in view of the unexpected rutile-like crystalline phase observed over the weight ratio of Sb/Ti in a range of from 0.42 to 2.93 (e.g., see the specification on page 19, Table 1, Examples 4 – 11), and further in view over the desirability of the rutile crystalline phase over the anatase crystalline phase as discussed in the specification, for example, on page 1, lines 20-21 (i.e., greatest hardness, density, and refractive index).

For at least these reasons, the rejection of claims 1 and 15 under 35 USC § 103(a) as being unpatentable over Bruno has been overcome and should be withdrawn. Claims 4-6 have been cancelled. Claims 2, 3, 7-13 and 20-24 depend from patentable claims and are therefore likewise patentable.

Reconsideration and withdrawal of the rejection of claims 1-13, 15 and 20-24 under 35 USC § 103(a) as being unpatentable over Bruno is requested.

Claims 1-15 and 20-24 stand rejected under 35 USC § 103(a) as being unpatentable over Bruno, US 5,776,239, in view of Nikon Corp, JP 06-329988, as evidenced by Patent abstracts of Japan, JP406329988A, and the corresponding machine translation, Japan Patent Office. The Patent Office asserts that Bruno (column 2, lines 27-33, and column 4, lines 54 et seq) discloses ultrafine hydrothermally treated powders as set forth above. The Patent Office further asserts that to the extent Bruno differs in the lack of an explicit teaching of particles having an organic moiety bound to the particle surface, Nikon Corp ([0025]-[0033] and [0082]-[0083]) discloses composite sols of titanium oxide and antimony pentoxide, wherein

[[0025]] the sol may be an aqueous or aqueous/organic solvent sol. Nikon Corp. lacks a disclosure of the crystalline form of the commercial sols. The particles sizes are disclosed as 1-200 nm, preferably 5-100 nm. Nikon Corp ([0029]) teaches the incorporation of a organic silicon compound or hydrolyzate as a sol constituent and ([0025]) teaches the addition of an organic amine for stabilization.

Without agreeing to the Patent Office's characterization of Bruno or Nikon Corp (JP 06-329988), or conceding that there is even proper motivation to combine the references, Applicants submit that Nikon Corp. fails to supply the deficiencies of Bruno relative to currently amended claims 1 and 15 as set forth in the discussion of Bruno above.

It is submitted that, for at least these reasons, the rejection of claims 1 and 15 under 35 USC § 103(a) as being unpatentable over Bruno in view of Nikon Corp. has been overcome. Claims 4-6 have been cancelled. Claims 2, 3, 7-14, and 20-24 depend from patentable claims and are therefore likewise patentable.

Reconsideration and withdrawal of the rejection of claims 1-13, 15 and 20-24 under 35 USC § 103(a) as being unpatentable over Bruno in view of Nikon Corp. is requested.

Applicants are separately submitting an Information Disclosure Statement with a translation of Nikon Corp, JP 06-329988 for the Examiner's convenience.

In view of the above, it is submitted that the application is in condition for allowance. Reconsideration of the application is requested.

Respectfully submitted,

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